International Journal of Research in Agricultural Sciences
Volume 5, Issue 3, ISSN (Online): 2348 – 3997

Water Productivity of Sweet Pepper (*Capsicum Annum*) Irrigated with Fish Pond Water

Akindele Ayodeji J. [1*] **and A. A. Olufayo**[2]
[1,2]Department of Agricultural and Environmental Engineering, Federal University of Technology, Akure, Nigeria.
*Corresponding author email id: akindele.ayodeji@gmail.com

Date of publication (dd/mm/yyyy): 23/05/2018

Abstract **— The aim of the work was to evaluate the water productivity of sweet pepper (*Capsicum annum*) irrigated with fish pond water. The experiment was conducted beside the fish pond of the Department of Fisheries and Aquaculture Technology, Teaching and Research Farm, the Federal University of Technology during the off season from December 2012- April, 2013 in Akure, Nigeria. Experimental design consisted of a Randomized Complete Block Design (RCBD) based on three treatments; 100% Potential evapotranspiration (PET) with fish pond water (T2), 50% PET with fish pond water (T1) and 100% PET with borehole water control, (T0) and replicated three times. PET was estimated to be 6 mm/day. Pond water quality and borehole water were monitored and results subjected to statistical analysis. Water quality parameters of both fish pond water and borehole water fell within the allowable irrigation limits. Sweet pepper responded positively to fish pond water via irrigation. Highest yield of sweet pepper was obtained by applying 598 mm of aquaculture effluent which gave 8.6 kg/ha at treatment T2, 6.4 kg/ha at treatment T1 and 0.75 kg/ha at treatment T0 respectively. The result provides useful information about fish pond water via irrigation and its related challenges in the agricultural sector.**

Keywords **— Water Productivity, Sweet Pepper, Fish Pond Water, Potential Evapotranspiration (PET), Irrigation; and Aquaculture Effluent.**

I. Introduction

Water is a vital resource but a severely limited one in most countries [17]. In recent years, there has been serious growing concern that the world is moving towards a water crisis [10]. In Nigeria, water is fast becoming an increasingly scarce resource and stakeholders are considering other feasible and sustainable source of water which can be use economically and readily available for sustainable food security and development. Recent changes in climate indicate that reliable quality and quantity source of water might pose a serious challenge.

Population growth, increased per capita use of the freshwater, the demands of industry and of the agricultural sector all mount pressure on the water resources. With attendant of desertification, severe drought conditions experienced in the northern region of the nation need prompt and adequate measure to quickly source for alternatives soil moisture to mitigate acute water shortages. Water shortages, particularly during periods of drought, have necessitated stricter control measures on rates of water consumption and development of alternative water sources [3].

Hence, fish pond water as wastewater and re-use is being courted as one of the best alternatives for compensating water shortages. Wastewater is a reliable source of water and after being collected it will be an available water source [18]. The reuse of water for agricultural irrigation is often viewed as a positive means of recycling water due to the potential large volumes of water that can be used.

Recycled water can have the advantage of being a constant, reliable water source and thus reduces the amount of water extracted from the environment. Reuse of wastewater pond water is currently receiving greater attention because of water shortages experienced. Use of wastewater pond water is a source of new water [28]. Globally, aquaculture is the fastest growing food sector and its economic importance is increasing concomitantly [23]; and [5]. Fish pond water contain a variety of constituents which include nutrients specifically nitrogen and phosphorus [6], dissolved or particulate organics and specific organic or inorganic compounds [22] and [7].

Therefore, the practice of fish pond water as a wastewater reuse should be massively considered with all sense of seriousness. The beneficial use of fish pond water and wastewater reuse is as a result of increasing demands on finite water resources, which has prompted the emergence of wastewater and reuse as an integral component of water resources management. More so, its efficiencies in crop management and the continuing increases in crop yields have increased demands on water resources for irrigation purposes. Pond waters are reused for irrigation purposes in many countries around the world on all of the populated continents [26]. A number of these countries have developed guidelines that give quality criteria and advice on how pond waters should be reused for irrigation purposes. The inherent benefits associated with fish pond water and wastewater as supplemental nutrient applications instead of discharge or disposal which includes preservation of higher quality water resources, environmental protection, and economic advantages.

Sweet pepper is an economically important crop for organic and conventional farmers. It is grown in most countries of the world [4]. Sweet pepper fruits are good source of many essential nutrients, including vitamins A, C, and E, carotenoids, minerals (e.g., calcium and iron), and other secondary plant compounds [19]. Pesticide residues in fruits and vegetables are of concern to consumers; consequently, interest in organically grown organic fruit and vegetables has increased [25]. This paper would examine and discuss the benefits from using fish pond waters for irrigation of sweet pepper (*Capsicum annum*) and outlined the potentials and possibilities and thereby suggest reasonable management practice to be adopted.

II. Materials and Methods

Experimental Site

The study was carried out beside the fish pond of the Department of Fisheries and Aquaculture Technology, Teaching and Research Farm, the Federal University of Technology, Akure, Nigeria, located at latitude 7° 14' N and longitude 5°08' E. It lies in the rain forest zone with a mean annual rainfall of between 1300-1600 mm and with an average temperature of 27°C. The relative humidity ranges between 85 and 100% during rainy season and less than 60% during the dry season period. Akure is an area of about 2,303 sq. km, situated within the western upland area [12] and at 350 m above sea level.

Experimental Design

The experimental design was a randomized complete block design (RCBD) of 12m × 12 m with an area of 144m^2 (0.0144ha).

Three (3) treatments based on 6mm/day of PET value were adopted viz-a-viz.

100% PET treatment using fish pond water (T2).

50% PET treatment using fish pond water (T1).

100% PET using borehole water (T0) and the three treatments were replicated three times.

Thus a total of 9 plots each measuring 1.5 m × 2 m were planted with pepper at a space of 0.45 m by 0.60 m to obtain a population of 81 plants. The experimental procedure involves the collection of fish pond water for the purpose of irrigation from the fish pond on weekly basis. The water from the pond is sufficient enough to meet the irrigation demand of the crop under study which is irrigated three times per week at an average of 543.6 mm of irrigation water. Laboratory analysis on total dissolved solids (TDS), biological oxygen demand (BOD), chemical oxygen demand (COD), electrical conductivity (E_C), sodium adsorption ratio (SAR), turbidity, total nitrogen (T-N) and phosphorus (P), pH, temperature (°C) and dissolved oxygen were carried out using standard methods at each irrigation.

Field readings such as hydraulic conductivity and bulk density were determined using core sample method and mini disk infiltrometer respectively. Soil moisture was also measured weekly in each of treatment plot to depth of 30 cm at 10 cm interval starting from the soil surface using gravimetric method.

Pond Water Sampling

Pond water samplings were collected from the fish pond of the Department of Fisheries and Aquaculture Technology, Teaching and Research Farm, the Federal University of Technology, Akure. Samples were taken weekly at a depth of 30cm below the water surface between January and April 2013, to make a total of 12 samples in all. Samples were collected into 150cl bottle container adequately and thoroughly washed with detergent and rinsed with sterile distilled water until it is acid free.

Before sampling at the location, the bottle was rinsed three times with the sample water before being filled with the pond water sampling. The sample was then kept immediately and transferred into cooler box containing ice to the Fisheries and Aquaculture Technology Department, Obakekere, FUTA for analyses within 24 hours after collection.

Measurement of Pond Water Characteristics

All measuring equipment were checked and calibrated according to the manufactures specification. The pH, temperature, electrical conductivity, and dissolved oxygen (DO) of the samples were measured on-site using a pH, DDS-307 Conductivity Meter and YSI 550 DO (www.ysi.com) respectively. All the examination followed standard methods and procedure [18]. The values of the determined parameters were compared with the World Health Organization (WHO), United State Environmental Protection Agency (USEPA) and Food and Agricultural Organization (FAO) standards for Agricultural and Domestic uses. Other measurements taken were: Turbidity, sodium adsorption ratio (SAR), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Dissolved Solids (TDS), Nitrogen (T-N), and Phosphorus (P).

Statistical Analysis of Data

Data obtained were subjected to statistical analysis such as descriptive statistic, one-way analysis of variance (ANOVA). As a follow up of ANOVA, Duncan's Multiple Range Test (DMRT) using statistical Package for Social Science (SPSS VER. 16.0) and Microsoft Excel software packages were also performed.

III. Results and Discussion

Soil Characterizes:

A summary of data on the soil's properties from the study site is shown in Table 1 below.

Table 1. Properties of soil sample from the study area

Parameter	Average Values
Bulk density (cm^{-3})	1.51
pH	5.90
Organic matter (%)	2.11
Nitrogen (mg kg^{-1})	0.62
Potassium (mgkg^{1})	0.19
Phosphorus (mgkg^{-1})	10.42
Calcium (mg kg^{-1})	2.50
Magnesium (mol kg^{-1})	1.00
Sand (%)	44.8
Clay (%)	37.2
Silt (%)	18.00
Organic Carbon (%)	1.23
Sodium (Cmol kg^{-1})	0.23

Source: Field Study (2012/13)

Characteristics of the Fish Pond Water and Borehole Water pH

The fig. 1 below showed pH of fish pond water ranging from 6.52 - 7.13 and 6.80 - 6.90 for borehole water. Generally, the obtained pH values for both fish pond water and borehole water fell within the World Health

Organization (WHO) of 6.50 to 8.50 for drinking water. Meanwhile, the values indicated that the fish pond water is slightly acidic, due to increase in size of fishes and its number. At 42 and 63 Julian days (JUD), pond water pH was 6.54 and 6.53 respectively. Observed pH in this study fell within the recommended target limit (6.5-8.5) for agriculture and aquaculture [11]; [27]. Similarly, pH values observed in this study corroborates with the previous literatures. [1]; [9]. However, [21] reported lower pH values (5.23-6.32) while [2] reported higher pH (8.94 - 10.34).

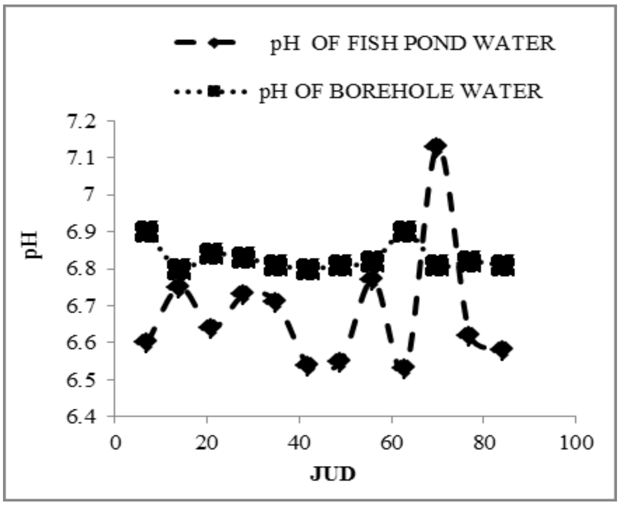

Fig. 1. Relationship between fish pond water pH, borehole water, and Julian Days (JUD) (WHO Standard limits is 6.5-8.5).

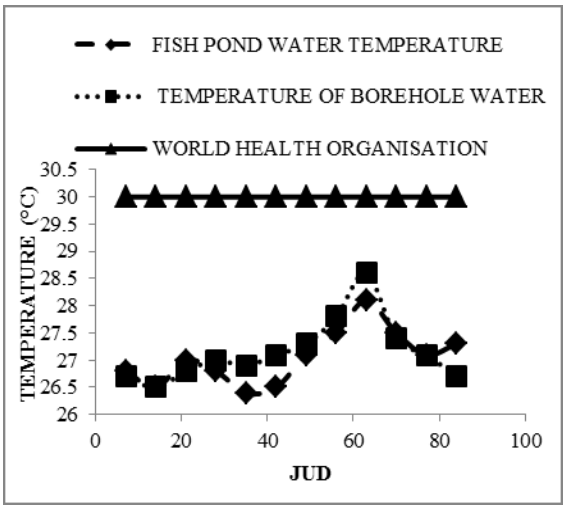

Fig. 2. Relationship between fish pond water temperature, borehole water, JUD and WHO Standard limits.

Pond Water Temperature

The fish pond water and borehole water temperature values reported in this work are within the range recommended by WHO (30°C) and National Guideline and Standards for water quality (20°C-30°C) in Nigeria for aquatic life, industrial and agricultural uses [13] as shown in fig. 2 above. These temperature ranges from 26.50°C to 27.13°C for fish pond water, while the borehole temperature ranges from 26.50°C to 28.60°C. Both pond water and borehole water temperature had 26.50°C at 14 JUD, while the former increase thereafter before subsequently decreasing as low as 26.40°C in 35 JUD for pond water temperature. However, the borehole temperature ranges from 27°C in 28 JUD to 28.60°C in 63 JUD. These temperatures fell within the acceptable limits for maintaining the fish pond stability and growth.

Electrical Conductivity (EC)

The electrical conductivity (EC) of fish pond water values ranged for 19.54 dS/cm – 33.20 dS/cm is within the WHO maximum permissible limits (8 - 10,000 dS/cm) for drinking water as shown in fig. 3 below. Meanwhile, EC of borehole water increases from 22.20 dS/cm at 14 JUD to 33.30dS/cm at 77 JUD. This is because soil irrigated with wastewater from fish pond contains higher EC. This is in line with findings of [24]; [15]. This is due to increase in level of concentration of cations available in the pond, nutrient deposits from the feed given to the fishes are factors responsible.

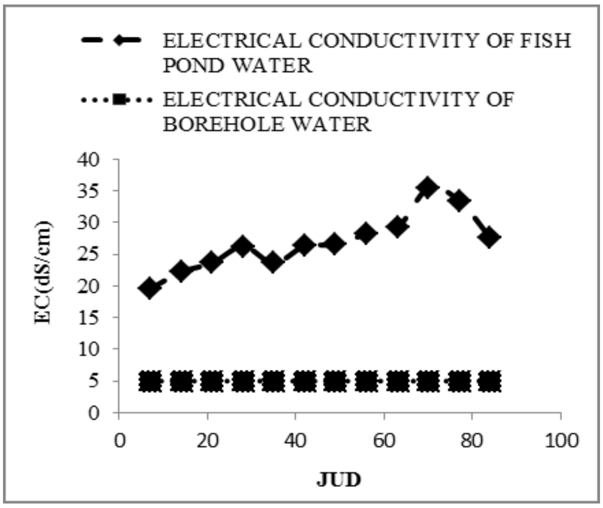

Fig. 3. Relationship between fish pond water electrical conductivity, borehole water and JUD (WHO Standard limits is 800 dS/cm).

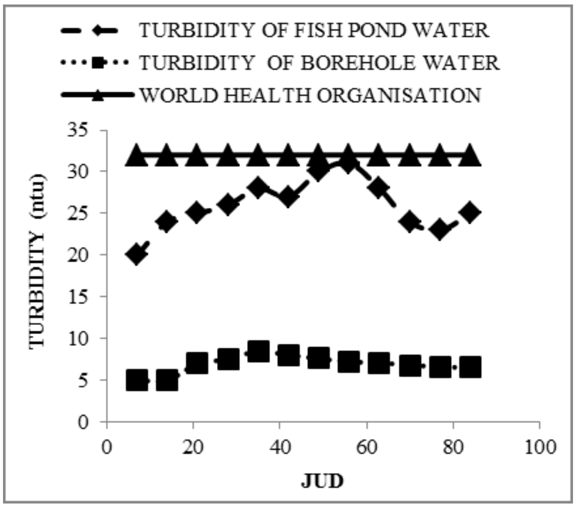

Fig. 4. Relationship between fish pond water turbidity, borehole water, JUD and WHO Standard limits

International Journal of Research in Agricultural Sciences
Volume 5, Issue 3, ISSN (Online): 2348 – 3997

Turbidity

The turbidity of fish pond water value ranged from 20 mg/l – 31 mg/l. The turbidity value obtained for fish pond is lower than the WHO recommended value of 33 mg/l, while that of the borehole is relatively lower compared to both fish pond water and WHO standard as shown on fig. 4 above. This was because of the presence of clay, silt, finely divided organic matter, plankton and other microscopic organisms [8]. Meanwhile, turbidity increases from 7 JUD to 56 JUD before it declines to 23 mg/l in 77 JUD.

Biochemical Oxygen Demand (BOD)

Biochemical oxygen demand (BOD) had its value ranged from 8.6 mg/l - 32.6 mg/l while that of borehole water ranged from 5 mg/l -15 mg/l as shown in the fig. 5 below. Also, biochemical oxygen demand increases from 7 JUD to 35 JUD at 9 mg/l to 27.7 mg/l and thereafter decreases before it rises up to 32.6 mg/l at 63 JUD. These values showed that borehole water fell within the FEPA standard except for fish pond water [14]. The FEPA limit is 30 mg/l. However, values obtained showed that borehole water do not have noticeable changes.

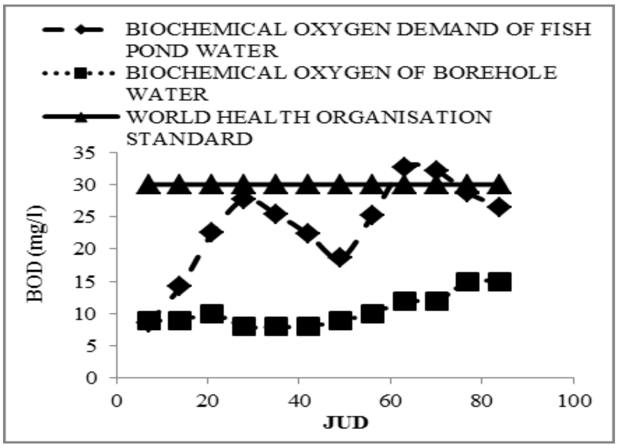

Fig. 5. Relationship between fish pond water biochemical oxygen demand, borehole water, JUD and WHO Standard limits.

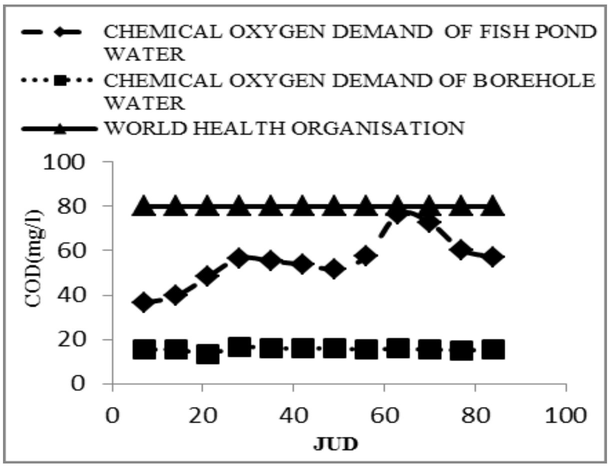

Fig. 6. Relationship between fish pond water chemical oxygen demand, borehole water, JUD and WHO Standard limits.

Chemical Oxygen Demand (COD)

Chemical oxygen demand (COD) of fish pond water value ranged from 36.46 mg/l-76.6 mg/l. Highest value of COD was obtained at 63 JUD and lowest at 7 JUD COD. Borehole water ranged from 13.1 mg/l -16.7 mg/l. Both COD of pond water and borehole water fell within the WHO recommended value for drinking water. Also, COD increases from 7 JUD to 63 JUD for both pond water and borehole.

Sodium Adsorption Ratio (SAR)

Sodium adsorption ratio (SAR) for pond water ranged from 1.8-4.2 and the borehole water of SAR ranged from 2.5 to 3.5. Both the pond water and borehole water fell within the recommended limits. Meanwhile, SAR of fish pond water increases from 14 JUD at 2.2 to 63 JUD at 4.8.

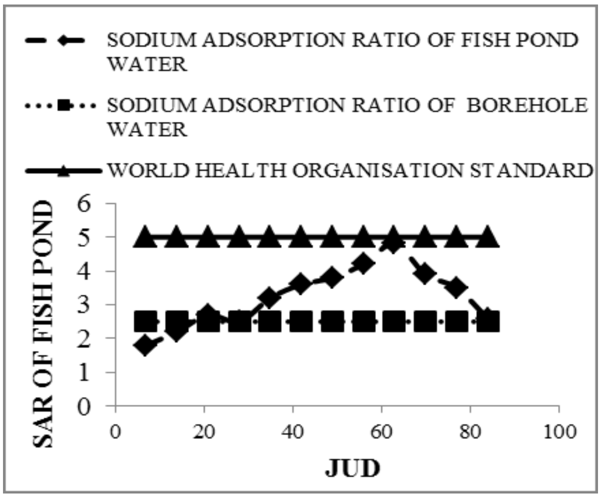

Fig. 7. Relationship between fish pond water of Sodium adsorption ratio, borehole water, JUD and WHO Standard limits

Total Dissolved Solids (TDS)

Fig. 8 below showed total dissolved solids (TDS) varied from 130 mg/l- 164 mg/l. The highest value being 164 mg/l and the least value is 130 mg/l in 56 JUD and 7 JUD respectively. TDS increases slightly and later decreases because of feed used to supplement pond nutrients which have been reported among others have capacity to increase total dissolved solids [20]. Meanwhile, borehole water ranged from 22 mg/l – 25 mg/l. Both fish pond water and borehole water are within the recommended value.

Nitrogen (T-N)

Nitrogen values in the pond water ranged from 12 mg/l-17 mg/l. This value is in line with the recommended set target of 10 mg/l. Meanwhile, nitrogen of borehole water which is 5 mg/l also fell within the recommended limits. From fig. 9, nitrogen values increases from 13 mg/l at 7 JUD to 17 mg/l at 49 JUD. This is in line with findings of [24] and [16]. Increasing the total nitrogen of the soil irrigated with fish pond water can be attributed to nitrogen different forms in the wastewater.

International Journal of Research in Agricultural Sciences
Volume 5, Issue 3, ISSN (Online): 2348 – 3997

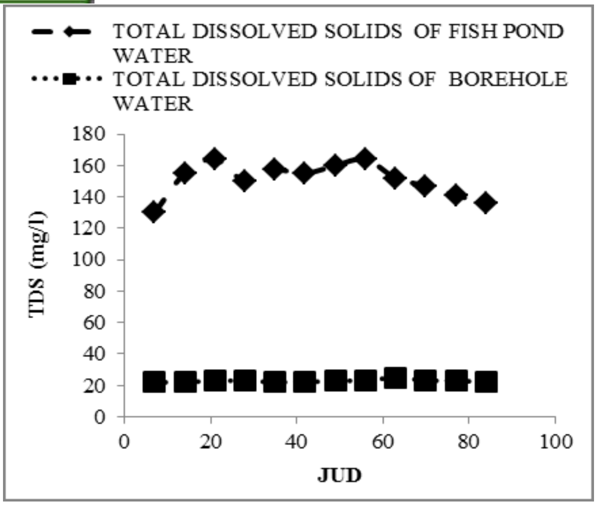

Fig. 8. Relationship between fish pond water Total dissolved solids (TDS), borehole water and JUD. (WHO Standard limits is 500 mg/l).

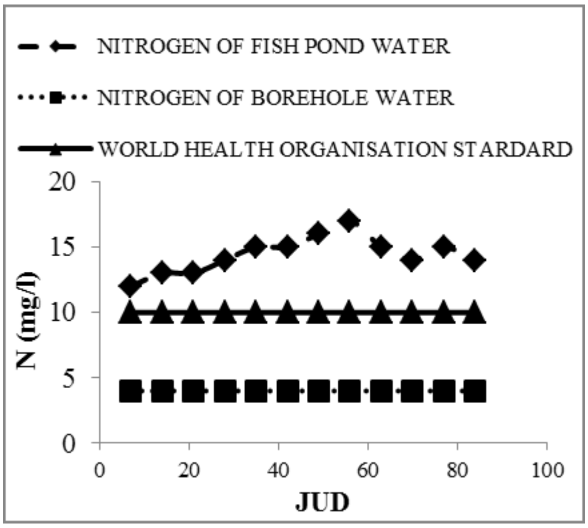

Fig. 9. Relationship between fish pond water nitrogen, borehole water, JUD and WHO Standard limits.

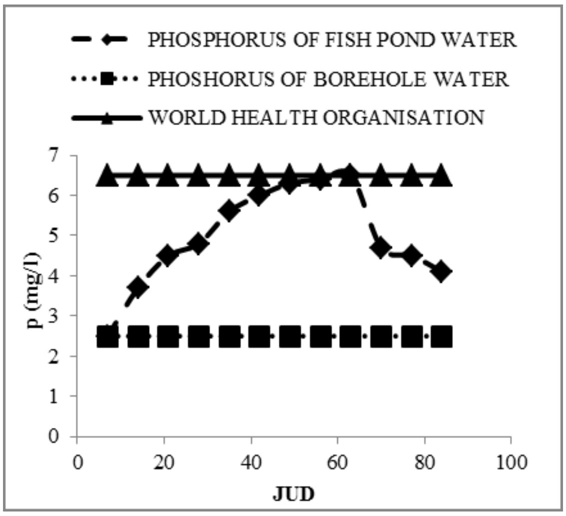

Fig. 10. Relationship between fish pond water total phosphorus, borehole water, JUD and WHO Standard limits.

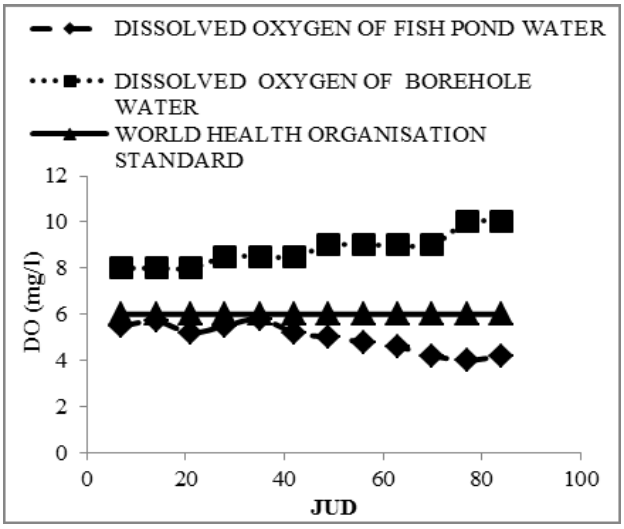

Fig. 11. Relationship between the dissolved oxygen of fish pond water, borehole water, JUD and World Health Organization (WHO) standard

Phosphorus

Total phosphorus is a measure of both inorganic and organic forms of phosphorus. It can be present as dissolved or particulate matter. It is essential plant nutrient and is often the most limiting nutrient to plant growth in fresh water. Fig. 10 above shows phosphorus pond water ranged from 2.5 mg/l- 6.5 mg/l while phosphorus of borehole water was 4 mg/l throughout the experiment. Both fish pond water and borehole water fell within the recommended tolerable limits.

Dissolved Oxygen (DO)

Dissolved oxygen (DO) is an important water quality parameter. The fish pond water has its dissolved ranged from 4.0 mg/l- 5.8 mg/l while the borehole water dissolved oxygen is between 8 mg/l-10 mg/l as shown in fig. 11. It was observed that dissolved oxygen increases from 21 JUD at 5.2 mg/l to 35 JUD at 5.8 mg/l before it gradually decreases as low as 4.0 mg/l at 77 JUD. This is due to fish development, plankton and other microorganisms all competing for the available oxygen in the pond. The dissolved oxygen for fish pond water fell within the WHO set limits. However, the borehole water fell short of the limit set.

IV. Conclusion

Field study was conducted at the Teaching and Research of the Department of Fisheries and Aquaculture Technology (FAT), FUTA to investigate the response of sweet pepper (<u>*Capsicum annum*</u>) to irrigation using aquaculture effluents. The conclusions are as follows:

The full irrigated treatment (i.e. T_{100}) produced the highest yield, while the treatment irrigated with borehole water (i.e. T_C) had the lowest yield. Hence aquaculture effluents had positive impact on the yield of sweet pepper.

The use of aquaculture effluent achieved at least 45% more in crop yield than when irrigated with borehole water.

Water quality parameters of both aquaculture effluent and borehole water fell within the recommended (allowed) standard limits.

Highest yield of sweet pepper was obtained by applying 598 mm of aquaculture effluent which gave 597.2 kg/ha in treatment T_{100}.

The aquaculture effluent was proved to offer alternative source of irrigation with nutrient for improved yield, quality crop development and suitability.

Therefore, sweet pepper (Capsicum annum) irrigated with fish pond effluent gave better performance compared with other tested treatments.

References

[1] Al-Ghazali, M, R and Al-Azawi, K,S. (1986). Detection and enumeration of Listeria monocytogenes in a sewage treatment plant in Iraq. *J. Appl. Bacteriol.,* 60:251-254.

[2] Akan, J. C., Abdulrahman, F. I., Dimari, G,A., and Ogugbuaja, V,O. (2008). Physicochemical determination of pollutants in wastewater and vegetable samples along the Jakara wastewater channel in Kano metropolis, Kano State, Nigeria. *Eur. J. Sci. Res.,* 23(1):122-133.

[3] Asano, T. (1998). (Ed.) Wastewater Reclamation and Reuse. Water Quality Management Library Vol. 10. Technomic Publishing Inc., Lancaster, Pennsylvania, USA.

[4] Bosland, P.W and Votava, E. (2000). Peppers: Vegetable and spice capsicums (CAB International, Wallingford, UK).

[5] Bosma, R.H. and Verdegem, M.C.J. (2011). Sustainable aquaculture in ponds: principles, practices and limits. *Livestock Sci.,* 139:58-68.

[6] Carey, R. O and Migliaccio, K.W. (2009). Contribution of wastewater treatment plant pond water to nutrient dynamic in aquatic systems: A review Environment Management, 44:205-217.

[7] Chavez-Crooker, P and Obreque-Contreras, J. (2010). Bioremediation of aquaculture wastes. Current Opinion in Biotechnol., 21:313-317.

[8] Durance, J. L. (1986). United States Geological Survey (USGS) water science for school. Retrieved 4, April, 2009. Pp 1-8. http://ga.water.usgsgov/edu/earthgw-qulity.htm

[9] El-Shafai, S.A., Gijzen, H, J., Nasr, F.A and El-Gohary, F.A. (2004). Microbial quality of tilapia reared in faecal-contaminated ponds. *Environ. Res., 95:231-238.*

[10] Falkenmark, M. (1989). The Massive Water Scarcity now Threatening Africa: Why Isn't it Being Addressed. *In Ambio, Vol.* 18, No.2.

[11] FAO (Food and Agricultural Organization) (1992). Wastewater treatment and use in agriculture-FAO irrigation and drainage paper 47.

[12] Fasinmirin J. T. and Oguntuase, A. M. (2008). Soil moisture distribution pattern in Amaranthus cruentus field under drip irrigation system. *African Journal of Agricultural Research Vol.* 3(7), pp. 486-493.

[13] Federal Ministry of Education (1992). National Guideline and Standard for water quality in Nigeria. Technical Adivisory Committee on water quality criteria, Nigeria pp 14-16.

[14] FEPA (1991).Guidelines and standards for environmental pollution control. Fed. Environ. Prot. Agency, 27:pp.20

[15] Jahantigh, M. (2008). Impact of Recycled Wastewater Irrigation on Soil Chemical Properties in an Arid Region. Pakistanian Journal of Biological Sciences. 11(18): 2264-2268.

[16] Khai, N.M., Tuan, P.T., Vinh, C, N and Oborn, I. (2008). Effects of using wastewater as nutrient sources on soil chemical properties in periurban agricultural systems. *VNU Journal of Science, Earth Sciences.* 24: 87-95.

[17] Mapandaa, F., Mangwayanaa, E. N., Nyamangara, J and Gillera, K. E. (2005). The effect of long-term irrigation using wastewater on heavy metal contents of soils under vegetables in Harare, Zimbabwe. Agriculture, Ecosystems and Environment. 107: 151-165.

[18] Metcalf and Eddy, (2003). Wastewater engineering: Treatment and Reuse. 4th Ed., McGraw Hill Publication.

[19] Marin, A., Ferreres, F., Tomas-Barberan, F.A and Gil, M. I. (2004). Characterization and quantification of antioxidant constituents of sweet pepper (Capsicum annuum L.) *J. Agr. Food Chem.* 52:3861–386.

[20] Ogbeibu, A.E and Edutie, L,O. (2006). Effects of brewery effluent on the water quality and rotifers of Ikpoba River, Southern Nigeria. *Ecoserve publishers*. Pp. 1-17.

[21] Ogunfowokan, A, O., Okoh, E, K., Adenuga, A, A and Asubiojo, O, I. (2005). Assessment of the impact of point source pollution from a university sewage treatment oxidation pond on the receiving stream- a preliminary study. *J. Appl. Sci.,* 6(1):36-43.

[22] Piedrahita, R. H. (2003**)**. Reducing the potential environmental impact of tank fish pond water through intensification and recirculation. Aquaculture, 226:35-44.

[23] Prein, M. (2002). Integration of aquaculture into crop–animal systems in Asia. Agricultural Systems, 71:127-146.

[24] Rusan, M., Hinnawi, S and Rousan, L. (2007). Long term effect soil and plant quality parameters. Desalination. 215: 143-152.

[25] United Nations *(*2003*)*. Organic fruit and vegetables from the tropics

[26] U.S. Environmental Protection Agency (USEPA). (1992). U.S. EPA. Offices of water and wastewater and compliance (Ed.) Guidelines for water reuse. U.S. EPA, Washington. WA State Water Strategy.

[27] (World Health Organization) (2006). Guidelines for the safe use of wastewater, excreta and greywater: wastewater use in agriculture, Vol.2. France (World Health Organization) (2006). Guidelines for the safe use of wastewater, excreta and greywater: wastewater use in aquaculture, Vol.3. France.

[28] Zadhooh (1996). Wastewater pond water irrigation effects on soil and plants M. S. thesis, Tehran University, Tehran, Iran.

Authors' Profiles

Mr. Ayodeji J. Akindele born in Akure on 23rd of February, 1983. He attended Federal Polytechnic Ado Ekiti, Ekiti State, Nigeria where he obtained National Diploma Certificate (ND) in 2005. Mr. Ayodeji J. Akindele obtained a Bachelor of Engineering in Agricultural Engineering from the University of Technology, Akure, Ondo State, Nigeria in July 2009, a Masters of Engineering degree in the Department of Agricultural & Environmental Engineering from the Federal University of Technology Akure, Ondo State, Nigeria in 2014. At the moment, he has worked as Operations Officer Assistance in Microfinance Bank from October, 2014 - 2015. Still in the same organization, he is a substantive Operations Officer from 2015 till date. My research interest lies in soil and water Engineering. I'm happily married to Mrs. Akindele Olusola C. and the union is blessed with a son.

Prof. A. Ayorinde Olufayo began his lecturing career in 1984. As a lecturer in the Department of Agricultural and Environmental Engineering, he rose to Professorial cadre in 2003, in Federal University of Technology, Akure. He has served the University in the different capacity. As a member of the senate, he has helped the Department and the faculty of Engineering to achieve e--xcellence in its academic pursuit. Owing to his passion for teaching and training, he was elected to serve as current Director of Centre for Research and Development (CERAD) and former Director of Works in the University. As a versatile and erudite and highly trained teacher, he has authored and published so many articles locally, nationally and internationally. His research interest is in soil and water Engineering. He's happily married to Prof. (Mrs) Olufayo and the union is blessed with children.